

# NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD

## GRASSED WATERWAY

(Acre)  
CODE 412

### DEFINITION

A natural or constructed channel that is shaped or graded to required dimensions and established with suitable vegetation.

### PURPOSES

This practice may be applied as part of a conservation management system to support one or more of the following purposes:

- to convey runoff from terraces, diversions, or other water concentrations without causing erosion or flooding
- to reduce gully erosion
- to protect/improve water quality.

### CONDITIONS WHERE PRACTICE APPLIES

In areas where added water conveyance capacity and vegetative protection are needed to control erosion resulting from concentrated runoff and where such control can be achieved by using this practice alone or combined with other conservation practices. This practice is not applicable where construction would destroy important woody cover and the existing water course is not seriously eroding. This practice shall not be used to alter a "stream channel" which is defined as a natural water course of perceptible extent, with definite bed and banks, which confines and conducts continuously flowing water.

### CRITERIA

#### General Criteria Applicable to All Purposes

Grassed waterways shall be planned, designed, and constructed to comply with all Federal, State, and local laws and regulations.

**Capacity.** The minimum capacity shall be that required to convey the peak runoff expected from a storm of 10-year frequency, 24-hour duration. When the waterway slope is less than 1 percent, out-of-bank flow may be permitted if such flow will not cause excessive erosion. The minimum capacity in such cases shall be adequate remove the water before crops are damaged.

On watershed subareas of less than 15 acres and the 10 year-24-hour peak flow is less than 10 cfs, the following criteria may be used for shaping the waterway in lieu of a detailed design:

#### **Parabolic Channel**

Waterway Slope %	Flow (cfs)	Design Depth (feet)	Top Width design depth (feet)
3 to 10	< 5	0.75	15
7+ to 10	5 to 10	0.75	15
3+ to 7	5 to 10	1.0	15
2 to 3	5 to 10	1.25	15

**Triangular Channel**  
(with 6:1 or flatter sideslopes)

Waterway Slope %	Flow (cfs)	Minimum Design Depth (feet)
6+ to 10	<5	1.0
4+ to 6	<5	1.1
2+ to 4	<5	1.25
8+ to 10	5 to 10	1.0
4+ to 8	5 to 10	1.25
3+ to 4	5 to 10	1.35
2+ to 3	5 to 10	1.5

On watershed areas of less than 5 acres and the 10 year-24 hour peak flow less than 5 cfs; refer to Practice Standard Critical Area Planting (342).

**Velocity.** Design velocities shall not exceed those obtained by using the procedures, “n” values, and recommendations in the NRCS Engineering Field Handbook (EFH) Part 650, Chapter 7, or Agricultural Research Service (ARS) Agricultural Handbook 667, Stability Design of Grass-lined Open Channels.

**Width.** The bottom width of trapezoidal waterways shall not exceed 100 feet unless multiple or divided waterways or other means are provided to control meandering of low flows.

**Side slopes.** Side slopes shall not be steeper than a ratio of two horizontal to one vertical. They shall be designed to accommodate the equipment anticipated to be used for maintenance and tillage/harvesting equipment that will cross the waterway. Where practicable, the side slopes for flat bottom waterways shall not be steeper than 4:1.

**Depth.** The minimum depth of a waterway that receives water from terraces, diversions, or other tributary channels shall be that required to keep the design water surface elevation at, or below the design water

surface elevation in the tributary channel, at their junction when both are flowing at design depth.

Freeboard above the designed depth shall be provided when flow must be contained to prevent damage. Freeboard shall be provided above the designed depth when the vegetation has the maximum expected retardance.

**Drainage.** Designs for sites having prolonged flows, a high water table, or seepage problems shall include Subsurface Drains (NRCS Practice Code 606), Underground Outlets (NRCS Practice Code 620), Stone Center Waterways or other suitable measures to avoid saturated conditions.

**Outlets.** All grassed waterways shall have a stable outlet with adequate capacity to prevent ponding or flooding damages. The outlet can be another vegetated channel, an earthen ditch, a grade-stabilization structure, filter strip or other suitable outlet.

**Vegetative Establishment.** Grassed waterways shall be vegetated according to Practice Standard Critical Area Planting (342), except on slopes of 2 percent or less waterways may be vegetated with annual crops. (Refer to Idaho Appendix No. 29 to Engineering Field Handbook Chapter 7 for suitable grass species).

Seedbed preparation, time of seeding, mixture rate, stabilizing crop, mulching, or mechanical means of stabilizing, fertilizer, and lime requirements shall be specified for each applicable area.

Establish vegetation as soon as conditions permit. Use mulch anchoring, nurse crop, rock, straw or hay bale dikes, filter fences, or runoff diversion to protect the vegetation until it is established.

## CONSIDERATIONS

Important wildlife habitat, such as woody cover or wetlands, should be avoided or protected if possible when siting the grassed waterway. If trees and shrubs are incorporated, they should be retained or planted in the periphery of grassed waterways so they do not interfere with hydraulic functions. Mid- or tall bunch grasses and perennial forbs may also be planted along waterway margins to improve wildlife habitat. Waterways with these wildlife features are more beneficial when connecting other habitat types; e.g., riparian areas, wooded tracts and wetlands.

On highly erosive soils and where vegetation is difficult to establish, sills may be installed to control minor head cutting within the waterway during grass establishment. Refer to Idaho Appendix to Engineering Field Handbook, Chapter 7 for spacing. Sills may be constructed of concrete, wood or other suitable materials. Sills shall extend across a minimum of two-thirds the waterway width for triangular and parabolic channels. In trapezoidal channels the minimum width shall be  $L = B + 1.33DZ$ : where L = Sill Length, B = Design water surface width in waterway, D = Design Water Depth, Z = Sideslope of channel. Concrete sills shall be a minimum of 4 inches thick and a minimum of 30 inches deep.

Impacts of sedimentation in channel should be evaluated. Excessively eroding upper watershed areas should be treated prior to constructing waterways in downstream channels.

Outlets for waterways should be constructed and stabilized as needed prior to constructing a waterway.

Where possible time the construction to facilitate seeding and vegetation establishment and/or use special protection

such as mulch, erosion netting, etc. during vegetation establishment. Temporary erosion protection may be needed between waterway shaping and establishment of vegetation.

Consider effects on downstream flows and aquifers that would affect other water uses and users.

Consider effects on erosion, movement of sediment, pathogens, and soluble and sediment-attached substances that could be carried by runoff.

Consider effects on the visual quality of onsite and downstream water resources.

Consider effects on wetlands and water-related wildlife habitats.

Water-tolerant vegetation may be an alternative on some wet sites.

Use irrigation in dry regions or supplemental irrigation as necessary to promote germination and vegetation establishment.

Provide livestock and vehicular crossings as necessary to prevent damage to the waterway and its vegetation.

Establish filter strips on each side of the waterway to improve water quality.

Add width of appropriate vegetation to the sides of the waterway for wildlife habitat.

## PLANS AND SPECIFICATIONS

Plans and specifications for grassed waterways shall describe the requirements for applying the practice to achieve its intended purpose(s). The drawings and specifications shall show location, cross-section(s), special requirements for spoil disposal and any protective works. The vegetative specifications shall include seedbed preparation, seed mix and rate, fertilizer rates when needed, timing of

seeding and mulch types and rates when needed.

## **OPERATION AND MAINTENANCE**

An operation and maintenance plan shall be provided to and reviewed with the landowner. The plan shall include the following items and others as appropriate.

A maintenance program shall be established to maintain waterway capacity, vegetative cover, and outlet stability. Vegetation damaged by machinery, herbicides, or erosion must be repaired promptly.

Seeding shall be protected from concentrated flow and grazing until vegetation is established.

Minimize damage to vegetation by excluding livestock whenever possible, especially during wet periods.

Inspect grassed waterways regularly, especially following heavy rains. Damaged areas will be filled, compacted, and seeded immediately. Remove sediment deposits to maintain capacity of grassed waterway.

Landowners should be advised to avoid areas where forbs have been established when applying herbicides. Avoid using waterways as turn-rows during tillage and cultivation operations. Prescribed burning and mowing may be appropriate to enhance wildlife values, but must be conducted to avoid peak nesting seasons and reduced winter cover.

Mow or periodically graze vegetation to maintain capacity and reduce sediment deposition.

Control noxious weeds.

Do not use as a field road. Avoid crossing with heavy equipment when wet.

- Engineering Field Handbook Chapter 7, Grassed Waterways and Outlets and Idaho Appendix #29

- SCS -TP-61, Handbook of Channel Design and Water Conservation

- Agriculture Handbook No. 667, Stability Design of Grass- Lined Open Channels

## **REFERENCES**

**NRCS, IDAHO**  
**February, 2002**